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Claims

[c1] 1. A monolithic rotor formed by machining a rotor forging, the monolithic rotor comprising first and second rotor regions axially aligned within the monolithic rotor and a transition zone therebetween, the first and second rotor regions being formed of different alloys and the transition zone having a composition that differs from and varies between the first and second rotor regions, the first rotor region being located within a high pressure region of the monolithic rotor and formed from an alloy chosen from the group consisting of CrMoV low alloy steels, martensitic stainless steels containing about 11 to about 14 weight percent chromium, Fe-Ni alloys, and nickel-base alloys, and the second rotor region being located within a low pressure region of the monolithic rotor and formed from an alloy chosen from the group consisting of NiCrMoV low alloy steels and martensitic stainless steels containing about 11 to about 14 weight percent chromium.

[c2] 2. The monolithic rotor according to claim 1, wherein the first rotor region has a higher creep rupture strength than the second rotor region and the second rotor region

has higher toughness than the first rotor region.

[c3] 3. The monolithic rotor according to claim 1, wherein the composition of the second rotor region is a NiCrMoV low alloy steel consisting of, by weight, about 2 to about 4% nickel, about 1 to about 2% chromium, about 0.2 to about 0.5% molybdenum, about 0.05 to about 0.2% vanadium, about 0.18 to about 0.35% carbon, the balance iron and incidental impurities.

[c4] 4. The monolithic rotor according to claim 3, wherein the composition of the first rotor region is a CrMoV low alloy steel consisting of, by weight, about 0.25 to about 0.75% nickel, about 0.8 to about 2.5% chromium, about 0.5 to about 1% manganese, about 1 to about 2.5% molybdenum, about 0.2 to about 0.35% vanadium, about 0.15 to about 0.35% carbon, the balance iron and incidental impurities.

[c5] 5. The monolithic rotor according to claim 3, wherein the composition of the first rotor region is a chromium-containing martensitic stainless steel consisting of, by weight, up to about 1.3% nickel, about 9 to about 14% chromium, about 0.1 to about 1% manganese, about 0.2 to about 2% molybdenum, about 0.1 to about 0.7% vanadium, up to about 3% tungsten, up to about 6% cobalt, about 0.03 to about 0.2% carbon, the balance iron and

incidental impurities.

[c6] 6. The monolithic rotor according to claim 3, wherein the composition of the first rotor region is a Fe-Ni alloy consisting of, by weight, about 24 to about 27% nickel, about 13 to about 16% chromium, less than 2% manganese, about 1 to about 1.5% molybdenum, about 0.1 to about 0.5% vanadium, about 1.8 to about 2.5% titanium, less than 1% silicon, less than 0.5% aluminum, less than 0.08% carbon, the balance iron and incidental impurities.

[c7] 7. The monolithic rotor according to claim 3, wherein the composition of the first rotor region is a nickel-base alloy consisting of, by weight, about 16 to about 20% iron, about 17 to about 21% chromium, about 2.5 to about 3.5% molybdenum, about 4.5 to about 5.5% niobium, less than 0.35% manganese, about 0.6 to about 1.2% titanium, about 0.2 to about 0.8% aluminum, up to about 1% cobalt, less than 0.08% carbon, less than 0.35% silicon, the balance nickel and incidental impurities.

[c8] 8. The monolithic rotor according to claim 1, wherein the composition of the second rotor region is a chromium-containing martensitic stainless steel alloy consisting of, by weight, about 11 to about 14% chromium, about 0.2 to about 1.2% manganese, about 1 to about 2.5% molyb-

denum, about 2 to about 3.5% nickel, about 0.2 to about 0.5% vanadium, about 0.05 to about 0.2% carbon, the balance iron and incidental impurities.

[c9] 9. The monolithic rotor according to claim 8, wherein the composition of the first rotor region is a CrMoV low alloy steel consisting of, by weight, about 0.25 to about 0.75% nickel, about 0.8 to about 2.5% chromium, about 0.5 to about 1% manganese, about 1 to about 2.5% molybdenum, about 0.2 to about 0.35% vanadium, about 0.15 to about 0.35% carbon, the balance iron and incidental impurities.

[c10] 10. The monolithic rotor according to claim 8, wherein the composition of the first rotor region is a chromium-containing martensitic stainless steel consisting of, by weight, up to about 1.3% nickel, about 9 to about 14% chromium, about 0.1 to about 1% manganese, about 0.2 to about 2% molybdenum, about 0.1 to about 0.7% vanadium, up to about 3% tungsten, up to about 6% cobalt, about 0.03 to about 0.2% carbon, the balance iron and incidental impurities.

[c11] 11. The monolithic rotor according to claim 8, wherein the composition of the first rotor region is a Fe-Ni alloy consisting of, by weight, about 24 to about 27% nickel, about 13 to about 16% chromium, less than 2% man-

ganese, about 1 to about 1.5% molybdenum, about 0.1 to about 0.5% vanadium, about 1.8 to about 2.5% titanium, less than 1% silicon, less than 0.5% aluminum, less than 0.08% carbon, the balance iron and incidental impurities.

[c12] 12. The monolithic rotor according to claim 8, wherein the composition of the first rotor region is a nickel-base alloy consisting of, by weight, about 16 to about 20% iron, about 17 to about 21% chromium, about 2.5 to about 3.5% molybdenum, about 4.5 to about 5.5% niobium, less than 0.35% manganese, about 0.6 to about 1.2% titanium, about 0.2 to about 0.8% aluminum, up to about 1% cobalt, less than 0.08% carbon, less than 0.35% silicon, the balance nickel and incidental impurities.

[c13] 13. The monolithic rotor according to claim 1, wherein the rotor is a steam turbine rotor.

[c14] 14. A steam turbine in which the monolithic rotor according to claim 13 is installed.

[c15] 15. The monolithic rotor according to claim 1, wherein the rotor is a gas turbine engine rotor.

[c16] 16. A gas turbine engine in which the monolithic rotor according to claim 15 is installed.

[c17] 17. The monolithic rotor according to claim 1, wherein the rotor is a jet engine rotor.

[c18] 18. A jet engine in which the monolithic rotor according to claim 17 is installed.